AGRICULTURAL PRACTICES AND PALAEOECONOMY

Posters

CROP MANURING DURING THE SECOND IRON AGE IN NORTHERN FRANCE, PRELIMINARY RESULTS

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A new form of rural settlement, known as the "enclosed farm", emerged in Celtic Europe during the Second Iron Age (5th-1st century BC) accompanied by a settlement densification and materializing a change in agricultural practices. In northern France, regional disparities were observed in the longevity of these farms, varying from less than 100 years to over several centuries. The reasons for these disparities are explored in terms of agricultural practices. Indeed, soil depletion is an inherent risk in agriculture: harvesting implies that the nutrients taken up by the crops are not returned to the soil. Crop rotation or the use of fertilizers are therefore required for the sustainability of the system; otherwise soil exhaustion could even lead to lands abandonment.
About 30 sites from the Paris Basin, Brittany and Champagne have been selected to investigate the fertility regime of soils cultivated with four cereals (*Triticum turgidum* ssp. *dicoccon*, *Hordeum vulgare* ssp. *vulgare*, *Triticum aestivum* ssp. *spelta* and free-threshing wheats). These three regions are distinguished by different aspects: soil types, crop types and longevity of settlements. The cereals come from stock remains, or at least from concentrations, which potentially reflect a single harvest. Manuring is traced using δ15N analysis of charred cereal grains in order to investigate the links between soils fertilization and habitats/networks longevity as well as differences in agricultural practices between cereals.

Key-words: stable nitrogen and carbon isotopes, cereal grains, manure, Second Iron Age, northern France

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PHYTOLITH ANALYSIS OF A MATERIAL FROM THE NEOLITHIC SITE RADČICE IN SOUTH BOHEMIA (CZECH REPUBLIC)

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The poster presents results of phytolith analysis of soil samples excavated from sunken features belonging to Linear Pottery culture and dated by 14C AMS dating to 5200-5000 B.C. Two vertical sections were analyzed in order to get a comparison of phytolith spectra deposited in different space and time.

The results show an unexpected homogenity of phytolith composition in the analyzed soil samples and thus provide some better understanding of the infill genesis mechanisms and origin of the material (probably an anthropogenic layer surrounding the features). Beside that, a quality of phytoliths points to certain plant species deposited in the archaeological sediment, which were probably exploited and used by the neolithic people for some purposes, or at least were present at the site (or it's vicinity) in a time close to the occupation phase. The samples contain a large amount of phytoliths belonging to Poaceae family, but residues which could be attributed to cereals were not found.

Key-words: phytoliths, neolithic, LBK culture, central Europe

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FIRST PALAEOETHNOBOTANICAL EVIDENCES FROM OPEN-AIR MESOLITHIC SITES IN SE IBERIA

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Current knowledge on subsistence practices of Post-glacial hunter-gatherers in southern Europe is based towards the zooarchaeological and malacological records, mostly from rockshelter-oriented research. In this context, the study of paleobotanical materials from open-air mesolithic sites holds a great potential to decipher paleoeconomic and domestic activities.
In this paper we report the first paleoethnobotanical evidences from the Mesolithic site of Arenal de la Virgen (Villena, Alicante), excavated within the context of the ERC project PALEODEM (Ref. 683018). This site contains a rich record of domestic structures -mostly fire-related features- and cultural layers dated to two different chronological phases at 9.3-9.1 kya and 8.6-8.4 kya, during the Early Holocene. Despite the pour preservation of organic materials in this kind of archaeological contexts, the application of systematic sampling protocols and screening procedures have allowed the first documentation of carpological remains. We have recovered wild seeds and pine cone scales, that suggest the use of some plants with alimentary aims. Also, a fungus rest of *Cenococcum*, likely carbonized, has appeared. Our results suggest a variety of gathering strategies of vegetal resources at the site, providing a valuable source of qualitative paleothnographic information for the Mesolithic period in Iberia.

Key-words: open-air sites, Mesolithic, carpological remains, sampling, gathering

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CARPOLOGICAL REMAINS BETWEEN THE END OF THE PLEISTOCENE AND THE BEGINNING OF THE HOLOCENE IN ITALY: ACQUIRED KNOWLEDGE AND NEW DATA

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Traditionally, paleocarpological research in Italy has primarily focused on agricultural settlements, as plant finds at these sites are generally abundant. The present contribution intends to examine the state of the art of Italian carpological findings in pre-agricultural contexts and to discuss new paleocarpological data related to these periods.
At Paleolithic and Mesolithic excavations sifting of the soil is preferred to flotation activity as the latter method is particularly time and money wasting. Nevertheless, Central European Palaeolithic contexts where flotation was extensively applied revealed the potential to recover abundant carpological remains even in pre-agricultral sites. In the frame of the HIDDEN FOODS - ERC Starting Grant project (PI: EC) aimed at understanding the role of plant foods in Palaeolithic and Mesolithic societies of Italy and the Balkans, we examined the results of an extensive flotation activity carried out between the 2016 and 2018 at 7 sites of Italy. The sites selected are located in different environmental contexts of northern, central and southern Italy both at high-altitude and coastal areas. A systematic manual flotation was applied to the excavated sediments. Such method allowed the recovery of abundant vegetal remains, underlining the potential of such recovery technique if applied to Palaeolithic and Mesoliothic contexts to provide important about the role of plant foods in ancient diet.

Key-words: Carpology, Pleistocene, Holocene, Italy

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STARCH GRAINS DESCRIPTION OF THREE TAXA WITH UNDERGROUND ORGANS FROM PATAGONIA AND ANCIENT USE IMPLICATIONS THROUGH MICROBOTANICAL STUDIES

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Underground organs were frequently reported by written documentary evidence from XVIth century onwards to have been an important food source for Patagonian original people. They were usually cooked in ceramic bowls. Their archaeobotanical evidence, however, is still limited to a very few macroremains. The objective of this paper is to develop skills for the identification of Patagonian underground organs from archaeological artifacts through microremains analysis, specifically starch grains, and to contribute to the understanding of the history of used of these plants in the region. Starch grains of two tubers (*Tropaeolum porifolium*, *Diposis patagonica*) and one rhizome (*Alstroemeria* sp.) were described along transversal section of each organ following standard methods and international nomenclature. Shape, size and polarization cross were the most diagnostic variables and allowed distinguishing *Diposis patagonica*'s as the smallest (mostly up to 15 µm in the major diameter) and most shape diverse starch grains. On the other hand, *Alstroemeria* and *Tropaeolum porifolium* had larger starch grains (mostly between 15 and 30 µm), predominantly spherical and oblong in both *taxa* but also triangular in the latter. Results were applied to the residue analyses of a Late Holocene pot sherd from Monte Loaysa (Santa Cruz, Argentina) from which starch grains affine to *Tropaeolum* were identified. Prehistoric use implications of this genus and underground organs in general are discussed.

Key-words: Underground organs, Patagonia, Starch grains, Microremains analysis, Pot residues

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ARCHAEOBOTANICAL EVIDENCE REGARDING THE DIET OF BRONZE AGE COMMUNITIES FROM TELEAC HILLFORT (ALBA COUNTY, ROMANIA)

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We present the archaeobotanical results from the last three years when were been made important discoveries regarding the diet of communities who inhabited here. These results are part of a major interdisciplinary project which is developing during 2016-2018 (LOEWE Project) involving the new technologies in archaeology in order to facilitated the interpretation of results.
The Teleac hillfort is located in the southeastern of Transylvania on the top of hill near to Mures River. The settlement from Teleac is classified as a princely one due to the archaeological discoveries made inside of the fortification.
One of the most important discoveries regarding the vegetal diet of Late Bronze Age communities from Transylvania was made in Teleac in 2017 in a domestic space (kitchen?) containing a lot of goods and seeds preserved by fire. There were been a lot of jars full with seeds most of them belonging to *Panicum miliaceum* and *Triticum spelta*. The archaeological artifacts discovered are belonging to Gava culture which is dated from Late Bronze Age.
We presume that the firing was the cause of abandonment of the house and also the cause of the perfect preservation of the domestic space which we may assume that was a kitchen typically for the LBA.

Key-words: macroremains, diet, Late Bronze Age, Transylvania, Romania

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ROTSELAAR-WIJNGAARD: THE DEVELOPMENT OF A FLEMISH CITY IN THE LATE MIDDLE AGES BASED ON δ13C AND δ15N ISOTOPES, AMS 14C-DATING AND MACROBOTANICAL ANALYSIS

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The site of Rotselaar-Wijngaard (Flanders, Belgium) has been excavated on account of a future allotment. Most features, structures and botanical samples dated from the Early to High Middle ages. A research grant from the Belgian government has provided the possibility to continue the archaeobotanical investigation and examine the development of the city in the 12th to 14th cent.
The medieval site Rotselaar was first mentioned in written accounts in 1044 and is located at the convergence of the rivers Demer and Dijle. This particular site can be used as a case study for the development of southern urban centers in the Low Countries during the Middle Ages. In comparison to other development centers in the low countries (eastern Hanseatic cities and northwestern Hollandic cities), the southern cities grew and prospered relatively early, from the 12th century onwards. Many towns in Flanders profited from the flourishing textile industry. For the site of

Rotselaar, we will examine the consequences of this development and increasing population pressure on the agricultural surroundings of the town. A combination of macrobotanical analysis, AMS 14C-radiocarbon dating, and nitrogen analysis (*δ13C and δ15N*) will be used to investigate the following themes:
-*Transitions within the available set of cereal species*: Changes of cereal crops available to the city's inhabitants will be established by macrobotanical analysis and AMS 14C-dating of carbonised cereal grains.
-*Demographic pressure indicated by increased fertilisation of crops*: The carbonised remains of cereals will be used for nitrogen isotope research. The isotope measurement will provide an indication to whether or not fertilisation took place on the fields surrounding the city in the consecutive periods. Fertilisation of the fields should lead to increased δ15N values in the grown crops. With the dated cereal remains at our disposal, we aim to distinguish chronological changes.

Key-words: Rotselaar, Medieval, Demographics, Fertilising, Isotopes

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THE RECONSTRUCTION OF THE FOOD ECONOMY, TRADE RELATIONS AND THE USE OF PLANTS IN THE TEXTILE INDUSTRY: A RESEARCH USING BOTH MACRO-REMAINS AND POLLEN ANALYSIS

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At Leiden (the Netherlands), an archaeological excavation was carried out in the historic city center of Leiden; the Garenmarkt. Samples were taken for archaeobotanical research from a large amount of cess- and manure pits, dating from 1350 to 1700. By using both macrobotanical and pollen analysis the food economy, trade relations and further use of plants by the residents of Leiden could be reconstructed.
Research of the plant remains from these cess- and manure pits showed that the diets of the residents of Leiden were quite variable, and included grains such as buckwheat (*Fagopyrum esculentum*) and millet (*Panicum miliaceum*), different types of fruit, nuts and vegetables. Also indications for import were found, this is reflected in the rather unique find of pomegranate (*Punica granatum*) seeds. Pomegranate, originating from Western Asia and Northeastern India, was imported from the 15th century onward in the Netherlands. Next to the pomegranate seeds, the presence of peach (*Prunus persica*) and cucumber (*Cucumis sativus*) remains indicate the wealth of the inhabitants. Both were cultivated in vineyards and gardens from the 16th century onward in the Netherlands.
Furthermore, botanical remains from plants from which colorants were extracted for dyeing were found. Dyer's rocket (*Reseda luteola*) and safflower (*Carthamus tinctorius*) were presumably used to dye textiles, and also flax (*Linum usitatissimum*) and hemp (*Cannabis sativa*) could have been used. This corresponds to the history of the square, since the Garenmarkt ('Yarn Market') was originally used for wool spinning and weaving. The botanical remains correspond with other artefacts from this site, such as spindles and a metal needle-case.

Key-words: Leiden, Dyeing, Import, Wealth, Pomegranate

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BEHIND THE BREW: A MULTIDISCIPLINARY APPROACH TO EARLY MEDIEVAL ALCOHOL FERMENTATION

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In early medieval Ireland (AD 400-1100), alcohol, particularly ale, was central to social gatherings and ceremonies, from the inaugurations of kings to the payment of labourers. This begs the question: how was ale made, presented and shared in Ireland's past? International studies on fermentation have developed useful scientific approaches and cultural understandings on the production and consumption of ale, but these approaches have not been applied to Irish material. This project will develop an international, multidisciplinary approach to better understand brewing and associated material culture in early medieval Ireland.
The project will examine evidence for fermentation in early medieval Ireland, drawing upon archaeobotany, material culture, historical writings, folklife and international ethnographies, along with scientific analysis to identify evidence for brewing in the archaeological record, analyse how fermentation affects the vessel and vice versa, and investigate the overall materiality of alcohol fermentation. In contemporary society, the emergence of the craft-beer movement demonstrates a new appreciation of the brewer and their creative outlet. This project will investigate choices made by early medieval brewers, in particular material selection, and the wider concept of the craftsperson.

Key-words: Material Culture, Archaeobotany, Ale/Beer, Foodways, Early medieval

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ARCHAEOBOTANICAL STUDIES OF LA TÈNE AND ROMAN SITES IN THE *CIVITAS TREVERORUM* (*GALLIA BELGICA*, SOUTHWESTERN GERMANY)

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The described archaeobotanical studies of La Tène and Roman sites in Rhineland-Palatinate and Saarland in southwestern Germany are part of the author‘s dissertation project on agriculture and plant food in these part of eastern Gaule. The principal goals can be summarized by three main questions: Can the Romanization in these area traced by archaeobotanical results? Are there differences among the archaeobotanical spectra of each site? Is the different natural environment of these sites reflected by the archaeobotanical results? In order to answer these questions four sites were selected: The late Republican military camp on the Petrisberg (Trier) represents a key site for archaeobotanical studies of the important transition period between Caesar and Emperor Augustus in the later *Gallia Belgica*. During these early period Roman troops with their own Mediterranean or romanized food habits came in these area. First results of the Petrisberg are evidencing new romanized food habits around 30 BC. The sites Wederath-*Belginum*, Kastel-Staadt and Borg give evidence of permanent settlements from the La Tène period to the late antiquity. These three sites are demonstrating the development from subsistence agriculture to surplus production to supply fortified central settlements (*oppida*) and, finally, to Roman agriculture with a huge surplus to

supply military, villages and towns. The poster is enabling a first view on the archaeobotanical results and outlines answers to these questions.

Key-words: Iron Age, Roman period, Food supply, Romanization, southwestern Germany

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HOW TO DISTINGUISH DUNG FROM FOOD REMAINS - A CASE STUDY FROM TWO SCANDINAVIAN IRON AGE SITES: ÅKER GÅRD AND SANDSERYD

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Dung and plant based food remains are not uncommon in archaeological samples, yet they are difficult to recognize and often end up in the very general group of amorphous charred objects. Interpretation of such remains is quite problematic as no standardized methodology and classification exists yet. The current presentation provides evidence for amorphous charred objects from two Iron Age sites: Åker gård and Sandseryd 396 (1st – 8th century AD) which will be discussed in the light of their possible interpretations as food or dung remains.
Preserved porous matter attached to some of the cereal grains was found in a posthole sample in Åker gård, west Norway. In most of the fragments, seed pericarp and traces of stems are visible. A seed of *Linum usitatissimum* was identified in one of the porous fragments. The only found cereal in the house is *Hordeum vulgare* var. *vulgare*. The weeds are represented by *Chenopodium album*, *Galium* cf. *spurium* and *Fallopia convolvulus*.
Similar amorphous remains were found in a fire pit at the site Sandseryd, southeast Sweden. The botanical material is dominated by stems and other vegetative plant parts, but it also contains cereals, mainly hulled barley and a few weeds (*Persicaria lapathifolia* and *Chenopodium album*).
Using different scientific approaches, we will use those case studies to propose criteria for distinguishing dung from food remains. Moreover, we would like to go further in the study of such remains.

Key-words: dung remains, food remains, Scandinavia, SEM analysis, Iron Age

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FOOD AND FARMING BEYOND ALPINE LAKE DWELLINGS - ARCHAEOBOTANICAL EVIDENCE FROM THE LATE NEOLITHIC SETTLEMENTS LENZING-BURGSTALL AND ANSFELDEN–BURGWIESE (BOTH UPPER AUSTRIA)

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An international research project ("Beyond Lake Villages", FWF I 1693, PI Timothy Taylor) is currently investigating settlements in the hinterland of the well-known pile dwellings of lakes Mondsee and Attersee in Upper Austria, with the goal of reconstructing the spatial networks of late Neolithic and early Bronze Age (agri-) cultural landscapes in the region. Charred plant macroremains from the two hinterland sites of Lenzing–Burgstall (1,517 plant macrofossil finds in total) and Ansfelden–Burgwiese (28,811 total finds) originating from Late Neolithic/Chalcolithic cultural layers were analysed as a contribution towards elucidating agricultural practices and food choices of the former inhabitants. In spite of the overall bad state of preservation at Lenzing–Burgstall, a decent spectrum of cultivated crops (hulled barley, einkorn and emmer wheat, lentil) together with surprisingly high quantities of hazel shell fragments was identified. The site of Ansfelden-Burgwiese, on the other hand, contributes not only additional taxa (free-threshing wheat, bitter vetch, "new" glume wheat) to the spectrum, but also allows for a preliminary differentiation of contexts indicating cleaned cereal stocks vs. places of cereal processing activities. Apart from archaeological contextualisation, the ongoing work will contrast these results with the waterlogged finds from the neighbouring lakeshore settlements of Seewalchen and Weyregg II, and place them within their regional palaeoecological contexts.

Key-words: late Neolithic lakeshore dwellings, plant macrofossil analysis, agricultural systems, cereal processing

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ARCHAEOBOTANY OF THE POLYCULTURE SITES. RAKOVICE (SOUTH BOHEMIA): ROMAN PERIOD OR EARLY MEDIEVAL?

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Postdeposition processes are one of the important factors of the formation of the archaeological record. Ignoring them may caused a misinterpretation of the data. Dating of the infill of archaeological features only based on artefacts analysis may not always be sufficient. There are same cases where a feature contains in addition to the primary material (both artefactual or archeobotanical) an earlier residue or a later intrusion.
As an example we present research on a polycultural site in Rakovice, where a superposition of two archaeological features of apparently various age was detected and then excavated. The stratigraphically later feature contained artifacts that could be classified as the Early Middle Ages. In the earlier feature only the finds of the Early Roman Period were present, with the combination (residue?) of artifacts of the Iron Age (final La Tène Period). Such a combination of the Early Roman and concluding La Tène Period is repeating on various sites in Bohemia. A representative set of plant macroremains, a similar spectrum of botanical taxa, was obtained from both features. Radiocarbon dating of the seed, however, showed the likely occurrence of both sets of plant remains in the Early Middle Ages. Particular answer from a single site opens the possibilities of interpretation in similar cases.

Key-words: Early Roman Period, Early Medieval Period, Postdepostion Processes

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AGRICULTURAL PRACTICES IN LATE 2ND MILLENNIUM BC MAINLAND GREECE

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The archaeobotanical record of LBA Greece comprises a variety of crops, in northern Greece grown under an intensive garden type regime, as indicated by weed and isotopic data. The same regime was tentatively proposed for non-palatial Mycenaean agriculture, in the absence of vast evidence from rural settlements in the South. On the other hand, Linear B texts, exclusively geared to palatial interests, envisaged crop specialization along with records of large land-holdings and oxen-teams, all taken by Halstead in the early '90s as suggestive of extensive agriculture. Archaeobotanical assemblages from palatial sites, though available, were inherently of limited dynamic, mainly due to the sampling methods (handpicking), not favoring recovery of small-sized wild seeds. This paper discusses charred remains recovered through flotation from two non- and one palatial Mycenaean settlements, and from a tell-site in Northern Greece. The new datasets verify crop diversity throughout Greece. Weed analysis shows great variability featuring species characteristic of both modern gardens and fields, while the application of intensive techniques is confirmed by isotopic analysis in two of the sites studied. Bringing together evidence from recently published assemblages, the ongoing discussion regarding the application of agricultural practices in settlements of different sociopolitical and economic organization in late 2nd mil. mainland Greece, is further enriched.

Key-words: weeds, crop husbandry, isotopic analysis, Late Bronze Age, Greece

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OUTSTANDING FIND OF MELEGUETA PEPPER FROM MEDIEVAL LAYERS IN TURKU (ÅBO) FINLAND

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Turku (in Swedish: Åbo) is the oldest town in Finland and despite its rural character in early 14th century, it had international contacts overseas. Parts of this medieval town are well preserved, and the archaeological layers are often rich in archaeobotanical remains due to the moisture and clayey soil. In the heart of the medieval town of Turku, excavations were conducted at the Cathedral Gymnasium and a well-preserved latrine and a yard for animals were revealed. Due to the good preservation conditions, archaeological latrines are usually an excellent source of information e.g. on past diet and waste disposal.
Botanical (seed, pollen, moss) and zoological (animal bones, invertebrates) remains from the latrine fill and from the yard at the Cathedral Gymnasium were analysed and, as expected, material shows evidence of everyday dietary, usage of local resources, true imports and local vegetation. Most outstanding macrofossil find was Melegueta pepper (*Aframomum melegueta* K. Schum.). Melegueta pepper originates from West Africa, and to Finland it most probably arrived through the

Hanseatic League. In medieval Turku, usage of melegueta pepper indicated high status of the inhabitants. More than 80 plant taxa were identified from the latrine and the yard, and from the latrine most part of the taxa is imported, while the material from the yard is mainly of local origin.

Key-words: Aframomum melegueta, pepper, medieval, Finland

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EARLIEST EVIDENCE OF *CITRUS* FRUIT IN THE IBERIAN PENINSULA

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The cultivation of *Citrus* fruit in the Mediterranean basin is recorded since Classical times. Several Roman sites in Egypt and Italy offer evidence of seed and pollen remains of *Citrus* species. Yet, to date, archaeological evidence of *Citrus* species is nowhere to be found in sites of the Western Mediterranean. Historical texts suggest that they were introduced in the region in the Middle Ages by new populations linked to the Islamic occupation of the Iberian Peninsula. There is, nonetheless, no material record of its cultivation in this period.
The paper presents the results of new archaeobotanical analyses carried out at several Islamic sites in the Iberian Peninsula, notably the sites of Lorca (Spain) and Mértola (Portugal). Both yielded a large number of well-preserved seeds and fruits in a carbonised and mineralised state. Fruit remains are particularly abundant, especially in the context of latrines, where more than 60,000 seeds were identified. Among them are several *Citrus* seeds, the first cases in the Iberian Peninsula unearthed in levels spanning the 9th to the 11th century AD. This evidence confirms the written sources that indicate that *Citrus* fruits were introduced in this region by the Arabs in medieval times.

Key-words: Al-Andalus, Medieval, Islamic, Agriculture, Citrus

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ARCHAEOBOTANY AT MOTYA (ITALY)

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The archaeobotanical analyses carried out at the archaeological site of Motya (Sicily, Italy), a small island found in the Marsala Lagoon, in Western Sicily (Italy), are presented. Although the Phoenician-Punic period (late 8th century BC – 397 BC) represents the main occupational phase of the archaeological settlement, the island was occupied by indigenous populations since the 17th century BC and continued to be inhabited after the Siege of Motya (397/6 BC). The multidisciplinary study, which includes anthracology and carpology, aims at reconstructing the diet, land use

and exploitation of natural resources on the island. Analyses focus mostly on the western slopes of the Acropolis, where a big disposal pit, dated from the end of 8th to the 6th century BC, was identified. Preliminary analyses reveal a vast assemblage of cereals (including H*ordeum vulgare, Triticum monococcum, T. dicoccum* and *T. aestivum/durum*), pulses (*Cicer arietinum, Lathyrus* sp., *Pisum sativum, Vicia faba* and *V. ervilia*) and fruits. These include *Vitis vinifera*, represented both by seeds and pedicels, and *Punica granatum*, whose spread to the Western Mediterranean is attributed to Phoenicians. Also weeds (*Agropyron repens, Lolium perenne, Poa* sp. and others) were found. In terms of charcoals, the most represented species are *Olea europaea* and *Quercus ilex*. This study, along with palynological analyses, should give a complete overview of the plant cultivation and plant use of the Phoenicians at Motya.

Key-words: Phoenicians, Sicily, carpology, anthracology, palynology

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WOODEN PESTLES FOR RICE PROCESSING IN EAST ASIA

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So many wooden artifacts, dating from the early Neolithic to Han period had been excavated in South China, Korea and Japan. Wooden tools had been used in various subsistence activities including food processing. In East Asia, wet-rice cultivation started in the Yangtze River Valley and then spread gradually to surrounding area with many tools as well as pestles and mortars. In this article, the author shows various changes in shape, size, conversion of timber and usage of pestles that occurred in diffusion of wet-rice cultivation to the east. In the Middle Yangtze River Valley, a small pestle which is 22cm long was found in Bashidang site. It was single-head pestle (using only one edge) with edge wear marks. When this short pestle was used, user sit on the ground. And in the Lower Yangtze River Valley, much longer pestles (about 90cm long) were used in Hemudu cultre sites (Hemudu site, Tianluoshan site). They were also single-head pestles but used by standing users. As mortars, stone or hardened ground was used probably. Afterwards, this type of pestles were assumed to change into two types: double-head pestles (using both edges) and pestles worked by treading. The former type of pestles were excavated from Bronze Age sites in South Korea. They are more than 120cm long and have drum-shaped protrusion at the middle of pestles. This type of pestles were brought to Japan at the beginning of Yayoi Period with many wooden tools (hoes, wet paddy smoothers, weaving tools and so on).

Key-words: pestles and mortars, wet-rice cultivation, spread eastwards and changes

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AGRARIAN PRACTICES AND CHANGES BY INVESTIGATING WEED FLORA IN NORTH-WESTERN FRANCE FROM THE BRONZE AGE TO THE IRON AGE

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The lack of archaeobotanical datas in North-Western France was highlighted by several papers and national studies conducted by the National Institut of Preventive Archaeology. Most of the first

analysis were carried out in Calvados, where the major crop seemed to be pulses. The archaeobotanical datas also confirmed the presence of cultivated oat and pulses in storage pits in these dwellings during Late Iron Age.
The first aim of this research was to conduct new studies and collect datas in Brittany, Normandy and Loire region. The data base includes 29 sites and 510 samples from 327 structures. The issue of this PhD focus on agrarian systems, crop production and its changes. The agrarian practices were investigated by inferring the weed flora composition and its ecological characteristics. The chronological frame covers a time span from the Bronze age until the Roman period.
The results reveal common trends and dynamics with the Northern France and Europe. For example a diversification process of the cultivated species is confirmed from the Late Bronze Age. Moreover several components are identified as being specific to these regions during Late Iron Age. For example: the abundance of pulses in Calvados; the limited rate of naked wheat; the rise of Oat and Spelt; hulled Barley or Emmer as the main crop of sites from Armorican Massif or Paris Basin. The results indicate intensive cultivation practices and diversified crops. During Iron Age, there are more differences between sites and cultural systems.

Keywords: Iron Age, Bronze Age, Weed flora, Crop production, North-Western France

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THE LATE HOLOCENE FOREST TRANSFORMATION IN SANDSTONE LANDSCAPES OF THE CZECH REPUBLIC

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We studied transformation of the forest vegetation using fossil charcoal from rockshelters. As a study area, we chose sandstone landscapes that appear to be an exceptionally suitable for archaeobotanical research due to the fact that many rockshelters offer long-term anthracological archives. The anthracological research was carried out in the context of parallel archaeological investigations. Our research is focused on the comparison of the macrocharcoal records from rockshelters with different geomorphological positions. The site-specific records provide insights into long-term changes within different local habitats, since the Early Holocene to the present.
The distribution of individual arboreal species was clearly related to the position within local environmental gradients. Our research documented remarkable differences between species-rich assemblages from rockshelters situated in the humid valley bottoms and species-poor assemblages from rockshelters located in the dry upper parts of the slopes. Anthracological results recorded relatively fragile equilibrium of local forest ecosystems in the Middle Holocene. Their deep transformation occurred at the onset of the Late Holocene (around 4 ka BP) when species-rich, productive forest communities were replaced by low productive, acidic forests with a smaller species pool. Our study documented the effects of increased human activities. We assume that especially pastoral ones played an important role in the forest transformation.

Key-words: charcoal analysis,sanstone rockshelters, human impact, forest transformation

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EXPLORING NEOLITHIC SUBSISTENCE AND AGRICULTURE IN CENTRAL MACEDONIA, NORTHERN GREECE: RECENT EVIDENCE FROM THE SITES OF KYPARISSI AND KORONEIA (MIDDLE- FINAL NEOLITHIC)

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During the last decade, a large number of prehistoric sites have come to light in Central Macedonia, Greece, due to large scale construction work and rescue excavations. Two of these excavations, Kyparissi and Koroneia, invested time and resources towards the retrieval of archaeobotanical material. Its study allows us to explore the relationship between humans and the environment, the ways of transforming it for fields, pastures. At the same time this material offers insights into daily lives, crop-processing activities, food habits and special events. The material from Koroneia originates from an extended site and the content of pits. The material from Kyparissi, a huge low mound, originates from hearths, floors, food related constructions, pits and vessels. The two sites present us with two distinct archaeobotanical assemblages in terms of composition and context and allow insigts into daily activities, special events and processes leading to differential archaeobotanical assemblages between tells and flat sites.

Key-words: Cereals, pulses, wild plants, Neolithic, Northern Greece

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APPROACHES TO MEDIEVAL AGRICULTURE IN IBERIA: NEW DATA ON CROPS AND STORAGE

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This contribution presents results from recent archaeobotanical work in Medieval Iberia from a variety of contexts including Christian, Islamic and Jewish sites. A great diversity of cereals and legumes together with the evidence of fruit and herb consumption and the presence of wild plants likely to have been consumed summarize the evidence found in the archaeobotanical record of Medieval Iberia. Data suggest also some degree of variability across regions which need to be better understood. An interesting aspect of the study of medieval agriculture relates to the variability of storage systems. It is particularly in the context of large-scale storage, that we explore an intriguing feature that can be found in often-forgotten corners in several regions of Iberia (Andalucía, central Spain, Valencia, upper Ebro Valley), the so-called perched or cliff granaries, also known as window caves. These have remained unexplored despite their potential for providing crucial information not only on the variety of crops stored but also on other aspects of the medieval society (storage practices, agricultural production, but also on the identity of their users). This poster will present data on some of archaeobotanical material found here and their potential for gaining insights into medieval agriculture.

Key-words: Agriculture, crops, storage, medieval, Iberia

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INVESTIGATION OF CEREAL REMAINS DISCOVERED FROM THE DEFENSIVE CITY SITE OF SHICHENGZI (~4-75 AD) ON THE SILK ROAD, XINJIANG, NW CHINA

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The Shichengzi site is a remnant of an important defensive city of the Han Dynasty along the Silk Road in the northern part of Xinjiang, China, that dates to ~4-75 AD. New archaeobotanical data recovered from the site was evaluated to gain a better understanding of the agricultural economy and living conditions of that military fortress of Han Empire in the Western Regions of China. Here, we investigated the cereal remains discovered from the Shichengzi site, four types of grains were identified in total: *Hordeum vulgare* var. *coeleste*, *Triticum aestivum*, *Panicum miliaceum*, and *Setaria italica*. It showed that the naked barley and bread wheat were the dominant species in crop structure. These findings revealed essential clues to the agricultural pattern and diet of the Han immigrants who farmed on the northern slopes of the Tianshan Mountains around 2,000 years before.

Keywords: Archaeobotany, Han Dynasty, Silk Road, City site, Xinjiang

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EVIDENCE OF ACORN 'CONSUMPTION' IN NORTHERN ITALY DURING THE BRONZE AGE

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Edible wild plants are still a relevant food source during Bronze Age, complementary to food production. Among these, acorns have received far less attention than other plant food. This might be due to taphonomic reasons as claimed by some authors. Starch-rich seeds are rarely preserved unless charred, thus their abundances are probably underestimated in archeological sites. Furthermore, acorn finds have been perceived for long as being gathered exclusively for feeding animals in the agrarian societies, due to their bitter taste. Human consumption was considered to be restricted to periods of famine. Nevertheless, there are several reasons to reconsider the role of acorns as staple food in prehistoric economy: their nutritive high value, their easy storing for long periods and the numerous ethnographic evidences. This paper considers acorn remains and pottery fragments with charred acorns fixed in the crust sticking to the inner side from different Bronze age sites in Northern Italy. Archaeobotanical and chemical analyses were carried out on these cooking residues. Furthermore, we add some hints about the taxonomical variability in acorn properties from modern oak stands in Northern Italy. Based on these results the potential use of acorns in human consumption is discussed. Hypothesis for additional usage of acorns are also explored.

Key-words: Acorn consumption, Quercus, Bronze Age, Northern Italy

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STUDY OF AMORPHOUS CHARRED FOOD REMAINS FOUND IN LITHUANIA

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Food is essential to our everyday existence, therefore paleo diet studies enables the recreation of various aspects of human behavior and identity. Study of ancient charred food remains has recently became quite popular among archaeologists. The identification of plants that amorphous charred food remains contain, the food form they embody and the techniques used to create them let archaeologists provide exclusive information about ancient cuisine and daily food preparation and cooking traditions.
The objects of the study are charred organic amorphous remains from Apuolė and Mažulonys hillforts, Bekesh hill in Vilnius and experimental comparative material. The chronology of studied material - 11-14th c. AD.
The study represented here was the first attempt to examine charred organic amorphous materials found in Lithuania by applying new methods that were never used in Lithuania before and try to identify what kind of processed food they are. Three methods were applied: scanning electron microscopy – in order to see the structure of the material and to determine preparation and cooking techniques; (2) ancient starch extraction – in order to identify what kind of cereal grains could have been used; (3) the comparison of archaeological material with experimental reference material.
Preliminary results showed that charred amorphous pieces examined are definitely a plant based food, most probably, bread made with sourdough.

Key-words: charred food remains, scanning electron microscopy, experimental archaeology, starch

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INTERDISCILPINARY STUDY OF HORTICULTURAL PRACTICES IN LATE MEDIEVAL BRUSSELS

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Over the last decades a series of sites attesting the presence of ancient crop fields and gardens were discovered in the historical center of Brussels. Well aerated crop field and garden soils with a high biological activity, are often not suitable for the preservation of organic plant remains. In most cases, their studies yielded only small quantities of more resistant seeds and fruits. The identification of the cultivated plants relied therefore mainly on phytolith analysis.
Recently, a Holocene peat sequence was excavated in the lower part of the city in a quarter that is historically documented as a horticultural area (*rue des Boiteux, BR295*). Micromorphology showed that the upper layers of the peat sequence were drained during the late Middle Ages and subsequently converted into horticulture. In this poster the potential of studying these contexts will be discussed. Thanks to the prevailing wet conditions of the soil, higher densities of waterlogged macrobotanical remains could be analysed. Remains of divers cultivated plants and garden weeds were found, most probably partly from the local vegetation and local cultivated crops. The archaeobotanical and archaeozoological studies also shed light on manuring practices.

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SURVIVAL OF THE FITTEST? AN ARCHAEOBOTANICAL APPROACH TO THE 6TH CENTURY CRISIS IN SOUTHWESTERN NORWAY

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An apparent decline in population and economy is seen in the archaeological material in Rogaland, southwestern Norway, from the mid-6th century AD. Many farms were abandoned and specialised crafts fell out of use. Some studies suggest that it took at least 500 years before the population reached the same levels as before the crisis. This decline has been much discussed in archaeology and put in connection with a climate deterioration following the dust veil of AD 536, the Justinian plague, starting in 542, or various economic or social transformations or disturbances. Palynological studies of this period have been conducted and interpreted in terms of agricultural abandonment, in Scandinavia and elsewhere, but plant macrofossils are still largely unexplored in this connection. In my PhD project, I study the agricultural development in relation to the crisis. I compile plant macrofossil data from the 5th to the 9th century AD in Rogaland, and discuss vulnerability and resilience strategies that could have been employed to cope with climatic, demographic, economic or social challenges. I will present results from a comparison between two settlements – one that was abandoned in the late 6th century and one that prevailed. Local conditions and choice of economic strategy contributed to the settlement's different fates, and the introduction of a new crop, rye, on one of them may have contributed to its survival.

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SHOULD RYE BROME BE CONSIDERED A CROP? CAN BROME-RICH ASSEMBLAGES, FOOD-PROCESSED GRAINS AND TEXTUAL REFERENCES HELP US TO CLARIFY THE PERCEPTION OF THE PLANT, ITS USES AND STATUS IN NORTHERN FRANCE, DURING THE IRON AGE AND HISTORICAL PERIODS?

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Rye brome, a winter-annual acidicline arable-weed of the Poaceae family, is a commensal species of crops, predominantly growing on sandy soils. Common in the carpological assemblages of northern France, the species is occasionally found in large quantities at different times, in proportions equivalent to that of a cultivated plant. In the Latenian site of Arpents aux Chevaux in the commune of Plessis-Gassot, located north of Paris, residues of food treatment or food preparation, in the form of amalgamated seed-cakes, with the exception of any other species, have even been found. This raises the question of the status of the plant and its uses. Some bromes are currently grown as fodder, and livestock show a high appetite for their consumption. However, the old uses of the plant are much more difficult to discuss. It is usually considered a weed that proliferates in nitrogen-enriched loamy soils. Has it been occasionally tolerated in the fields or even cultivated? Has it been the subject of an abortive attempt at domestication? Was it perceived as a species distinct from cereals or as a degeneration of them? These are all questions that we will try to address in our contribution, based on the contexts that have delivered seed concentrations.

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